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BIOLOGICAL EVALUATION OF SOUTHERN PINE BEETLE ON THE NATCHEZ TRACE PARKWAY IN MISSISSIPPI

by

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ABSTRACT

An aerial survey and ground check for southern pine beetle (SPB) was conducted on the Natchez Trace Parkway in October 1980. Forty-four spots were ground checked. Twenty spots had tree mortality exclusively caused by SPB. SPB activity has decreased substantially since January 1980. SPB spots had an average of 2.7 infested trees per spot in October 1980 versus 28.0 in January 1980. Hot, dry weather in Mississippi this year has stressed host trees and increased the potential for spot proliferation and spot growth next year. Parkway personnel should watch for the development of new spots through next spring. If SPB activity does not increase by mid-summer 1981, SPB should be of little management concern the remainder of the year.

INTRODUCTION

On October 14-16, 1980, a biological evaluation was conducted on the Natchez Trace Parkway in Mississippi. The evaluation, including aerial survey and on-site examination, was conducted by personnel of Forest Pest Management (FPM), State & Private Forestry, U.S. Forest Service. The purpose of the evaluation was to determine the current status of southern pine beetle (Dendroctonus frontalis Zimm.) activity on the Natchez Trace Parkway.

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TECHNICAL INFORMATION

The southern pine beetle attacks all species of southern yellow pine. On the Natchez Trace Parkway, loblolly pine, Pinus taeda L., and shortleaf pine, Pinus echinata Mill., are the preferred hosts.

Type of Damage

Damage caused by the southern pine beetle is tree mortality resulting from adult beetles and larval galleries in the cambial region of the host trees. Blue-staining fungi (Ceratocystis spp.), introduced by the beetles and secondary insects, accelerate the kill by blocking the vascular system of the tree.

Life Cycle of the Insect

The beetles attack and construct winding egg galleries in the cambium. Eggs are deposited along the galleries. White larvae hatch from the eggs and further mine the cambium and then construct pupal cells in the outer bark. After transforming to adults, the beetles emerge. During the warmer months the life cycle is completed in about 30 days. In the winter, the life cycle may be as long as 2-3 months. There may be as many as 7 generations each year.

METHODS

Aerial Survey and Ground Checks

Southern pine beetle spots were observed from the air and ground checked to determine the number of trees currently infested with SPB. Numbers of infested trees were recorded at all ground checked SPB spots.

RESULTS

Aerial and Ground Surveys

The aerial survey was conducted by personnel of Forest Pest Management (FPM) located at the Doraville Field Office, Doraville, Ga. The survey was conducted October 8, 1980. A total of 41 SPB spots were observed on the Natchez Trace Parkway. The spots ranged in size from 1-20 red and fading trees. Twenty-three spots were < 5 trees, 9 spots were 5-10 trees, and 9 spots were 11-20 trees.

Forty-four spots were ground checked by personnel of FPM located at the Alexandria Field Office, Pineville, La. Data for all spots ground checked are summarized in Table 1. Table 2 summarizes ground check data for 20 spots where tree mortality resulted exclusively from southern pine beetle. The number of infested trees in these spots ranged from 1-15 with an average of 2.7. Figure 1 shows the area of heaviest SPB activity on the Parkway.

Table 1. Summary of Ground Check Data for the Natchez Trace Parkway, October 1980.

Type of Bark Beetles Causing Tree Mortality Within Spots	# Spots	Range of Inf. Trees	Total # Inf. Trees	Mean # Inf. Trees	Total # Inf. Trees by Crown Condition	
					Red	Green
Ips	9	1-7	19	2.1	18	1
Ips & BTB	2	1-3	4	2.0	3	1
SPB & BTB	1	-	4	4.0	1	3
SPB & Ips	3	1-12	15	5.0	13	2
SPB, Ips, & BTB	3	1-4	9	3.0	8	1
SPB	20	1-15	53	2.7	42	11
Inactive	6	-	-	-	-	-
TOTALS	44	1-15	104	2.4	85	19

Table 2. Summary of Ground Check Data for Spots Where Southern Pine Beetle was the only Bark Beetle Found Causing Tree Mortality on the Natchez Trace Parkway, October 1980.

Spot No.	Number of Infested Trees		
	Total	Red	Green
1	2	2	0
2	15	9	6
3	4	4	0
4	1	1	0
5	1	1	0
6	1	1	0
7	2	2	0
8	1	1	0
9	2	1	1
10	1	1	0
11	5	2	3
12	2	2	0
13	2	1	1
14	1	1	0
15	3	3	0
16	2	2	0
17	1	1	0
18	2	2	0
19	3	3	0
20	2	2	0
TOTALS	53	42	11
Mean	2.7	2.1	.55

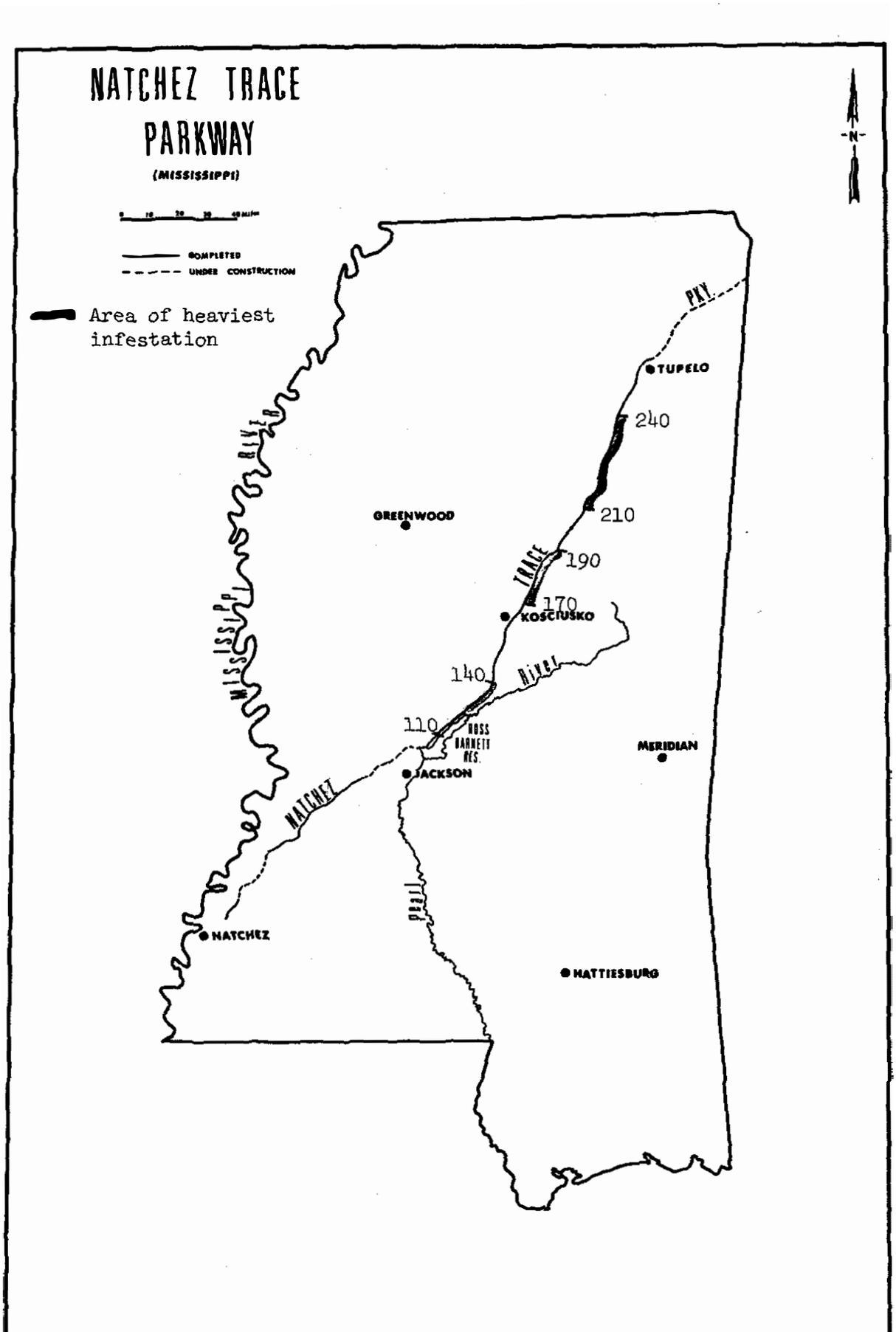

Figure 1. Area of heaviest southern pine beetle activity on the Natchez Trace Parkway.

DISCUSSION

Due to the small number of infested trees per spot, no attempt was made to predict SPB mortality for 1981.

The mean number of infested trees/spot has declined from 28.0 in January 1980 (Connor 1980) to 2.7 trees/spot in October 1980. However, hot dry conditions throughout Mississippi this year have stressed trees and increased the potential for spot proliferation and spot growth next spring. Therefore, Parkway personnel should be alert for the development of new spots through next spring. If SPB activity does not increase by mid-summer 1981, SPB should be of little management concern the remainder of the year.

There are some silvicultural stand manipulation measures that can be taken which would reduce the chances of SPB attack. Some of these are: thinning to reduce basal areas, planting which matches pine species to site, and removal of old growth trees. After SPB has attacked an area, there are several alternatives available which will reduce the number of trees killed. Following is a list of alternatives available to the Parkway for the management of southern pine beetle losses. A description of the implementation and management implications of each alternative is presented.

Alternative 1. Do nothing and allow the infestation to follow a natural trend.

SPB populations increase periodically. When they increase, large numbers of susceptible pine species are killed. This may occur from one to several years, and then the SPB population and the corresponding pine mortality will decrease. This will continue periodically until total transition to a climax forest occurs.

Some cutting will have to be conducted even if this alternative is chosen. Dead trees will begin to decay and eventually fall down. This will pose an attractive nuisance in areas with SPB mortality. Therefore, any dead trees near the edge of roads or in high-use areas should be cut.

Alternative 2. Remove trees through salvage.

Salvage is the method most often used for stopping the growth of existing spots. This strategy involves removing a buffer strip of noninfested trees, all green infested and red infested trees, and if desired, the trees already killed by the beetles. Costs associated with removing vacated trees are not charged to specifically designated SPB Project Control Funds since removing uninfested material is not needed for successful control even though it may be operationally desirable. The SPB spot should be carefully surveyed, and all trees to be removed should be marked.

To implement this alternative, the buffer strip should be cut first and felled toward the center of the spot. The buffer strip consists of uninfested trees surrounding the green infested trees. It should be 10-70 ft. wide for most active spots, while a 100 ft. strip (and occasionally larger) may be needed for large, rapidly expanding spots. As a rule, the width of the buffer should not exceed the average height of the trees in the spot. There are three major reasons for cutting the buffer strip. They are to insure that: 1) green infested trees which may have escaped detection are removed from the stand, 2) any delay between marking the spot and harvesting does not result in the spot spreading beyond its marked boundaries, and 3) to insure beetle activity in the area is disrupted.

The size of the buffer strip needed to prevent spots from starting again depends on three factors:

1) The length of time it will take to remove or treat the trees in a spot.

   One of the major reasons for cutting the buffer strip is to be certain all infested trees are removed. If it takes several days to remove all the infested trees, beetles will have emerged and attacked new trees. Therefore, the longer it will take to remove infested trees the larger the buffer needed.

2) The size of the original spot.

   Larger active spots have larger beetle populations. If more beetles are present, it is more difficult to control a spot, and a larger buffer strip is needed. Also, it will take longer to remove the larger number of infested trees so a larger buffer will be needed.

3) The intensity of survey after the spot is cut.

   If the spot is infrequently checked after cutting is conducted, the buffer strip will need to be larger. If a 10 ft. buffer strip is chosen during the summer months, the area should be checked at least twice a week for 2-4 weeks.

   A once a week check is adequate during the cool winter and spring months. However, the area should be checked for at least 4 weeks after cutting.

After the buffer strip is cut, all infested trees should be felled toward the center of the spot and removed to prevent beetles from emerging and attacking new trees. Infested trees should be cut and

removed as quickly after marking as possible to reduce the chances of beetles emerging and attacking new trees. In the summer it is possible for SPB to develop from egg to adult in 25 days. In the winter it may take 2-3 months for the beetles to develop. The following procedures reduce the chance of beetles killing additional trees: 1) fell infested trees toward the spot center to keep beetles as far away from non-infested trees as possible and 2) prevent falling trees from causing damage to the residual stand which would attract beetles.

If infested trees are removed and stored for firewood, special care should be taken. Beetles that emerge before the wood is burned could fly to any nearby pines and start a new spot. If the wood will not be burned before the beetles emerge, it should not be stored near uninfested trees, unless it is debarked. Infested bark should be burned immediately to kill its brood. Do not use any insecticide-treated trees for firewood or leave treated trees where they could be used for cooking fires or campfires.

After cutting is finished, the area should be immediately checked to determine if any infested trees were missed. If any newly infested trees are found, they should be cut. The area should then be checked for newly infested trees once or twice a week and for a period of 2-4 weeks depending on time of year. This needs to be done to insure the spot does not start again. The smaller the buffer strip, the more important it is to intensively survey the area after cutting. The spot could start again if any infested trees were missed at the time of cutting. If any infested trees are found, they should immediately be removed and the spot checked once or twice a week for another 2-4 weeks.

The limitations of this procedure are: 1) other trees may be mechanically damaged during the salvage operation, 2) the soil will be disturbed, and 3) the removal of infested pines will slow down progress towards the last phase of forest succession which is a climax hardwood forest (conversely, the beetles are speeding it up).

Alternative 3. Removal of only infested and buffer trees.

This is similar to Alternative 2, except only the buffer strip and currently infested trees would be cut. Size of the buffer strip and cutting priorities and methods would be the same as in Alternative 2. All vacated trees would be left standing. This would favor parasites and predators (including woodpeckers).

The limitations would be the same as Alternative 2. However, since fewer trees will be removed, there will be less logging impact to the site and less chance of damaging the residual stand.

Alternative 4. Cut-and-leave infested trees.

This is accomplished by felling a buffer strip of green uninfested trees and all infested trees toward the center of the spot. The buffer should

surround the green infested trees. In small spots the buffer may encircle the spot. However, the buffer should be no wider than the average height of the trees in the spot. Dead trees from which all SPB have emerged should not be felled. This will allow the beetle's natural enemies to complete their development and emerge. Such trees also provide den sites for certain species of woodpeckers. To insure the spot does not start again the area should be checked for newly infested trees once or twice a week for a period of 2-4 weeks depending on time of year. If any infested trees are found, they should be removed and the spot checked for another 2-4 weeks.

The purpose of this procedure is to stop spot growth. Use of this method causes beetles to disperse at a time of year when this behavior is unnatural. This results in a reduction of mass attacked trees and spot growth ceases.

The limitations with this control practice are: 1) it can only be used in the summer (May 1 - September 30) since these are the only months beetles are not dispersing, 2) it should only be used on small spots, normally 50 infested trees or less, and 3) this method has proven effective in Texas, but is still being evaluated in other areas, including Mississippi.

Alternative 5. Chemically treat infested trees.

In this method, infested trees are felled toward the center of the spot, cut into workable lengths, and sprayed with Lindane or Dursban® 4E. The buffer strip and vacated trees are not treated. The purpose of this method is to kill the beetle population. Also note, chemical treatments can be used in conjunction with Alternatives 2 and 3 when infested trees cannot be removed prior to beetle emergence.

In high-value areas, such as campgrounds or picnic areas, standing trees around the infested trees may be treated to prevent SPB attack. The insecticides Lindane and Dursban are registered for this purpose. A hydraulic sprayer should be used to apply insecticides to standing trees. The trunk should be sprayed as high as possible and until runoff occurs.

Limitations to this method are: 1) to be effective, all bark surfaces must be sprayed (this involves turning the logs which will be difficult due to the size of the trees involved) until runoff occurs, and 2) the temporary depression of nontarget organisms around the sprayed trees.

Lindane registration is being reviewed by the EPA at this time (rebuttable presumption against registration). Forest Pest Managment, Pineville, Louisiana, (phone 318/473-7280, FTS 497-7280), should be contacted prior to the use of chemical control for an update on latest restrictions or application procedures.

Alternative 6. Pile-and-burn infested trees.

Unmerchantable or inaccessible southern pine beetle infestations can be suppressed by cutting, piling, and thoroughly charring the bark of infested trees. This is one of the oldest SPB control methods and is effective when properly done. But because of high costs and environmental constraints, the practice has been used sparingly in recent years. The entire bark surface must be thoroughly charred to insure effective control. It is not necessary to cut, pile, and burn vacated trees.

To implement this procedure, identify and fell all infested trees toward the center of the spot. Do not cut a buffer strip. Check the area to insure no green infested trees have been overlooked. Pile the infested trees and burn the pile until all infested bark has been thoroughly charred. Check and treat breakouts the same as discussed in other alternatives.

Limitations with this control practice are: 1) burning should not be conducted on highly erodible soils, 2) burning must be restricted to periods of low fire danger due to danger of wildfire, and 3) Federal and State pollution laws may restrict burning in some areas.

SUMMARY OF RECOMMENDATIONS

1. If SPB control is conducted Alternatives 3, 4, or 5 may best meet the Parkway's current management objectives.

2. Parkway and FPM cooperation to evaluate cut-and-leave with a modified buffer should continue.

3. Parkway and FPM cooperation to implement hazard rating should continue.

DISCUSSION OF RECOMMENDATIONS

Since the Natchez Trace Parkway is a very narrow strip of land with other land ownership on either side, SPB can easily immigrate and emigrate between the two. Therefore, it would be impossible to suppress SPB on the Natchez Trace Parkway through removal of active infestations unless infestations on the adjoining land were also treated.

It would be possible to reduce SPB losses by using any of Alternatives 2-6. It is our understanding that the Natchez Trace Parkway's management direction is to minimize human disturbance in the area. Therefore, if the Natchez Trace Parkway decides to control some SPB infestations, Alternatives 3, 4, or 5 may best meet current management objectives.

Alternative 3, remove only infested trees and buffer, requires the most time and manpower but will minimize the effects to the residual stand the number of trees removed. Removing the smallest buffer strip will

produce the least damage to the stand. However, narrower buffer strips will require a greater amount of time and manpower after the spot is treated to insure the spot does not start again.

Alternative 4, cut-and-leave, would probably be quicker to use in larger stands of trees. However, more trees will be affected using this alternative than with the other alternatives because it will be necessary to fell a much wider buffer strip. Also, remember it can only be used from May to October.

Alternative 5, chemical treatment, may be used advantageously in high-value areas where site disturbance must be minimized. It can also be used in conjunction with Alternative 3 when removal of infested trees would create intolerable site disturbance.

A cut-and-leave treatment with a modified buffer was tried on the Parkway in 1980. Cooperation between the Parkway and FPM to evaluate this system should continue in 1981.

A hazard rating technique developed by Garland Mason (1979) has been provided to the Parkway. The Parkway could consider using this stand hazard rating system to help identify stands which would be high-risk areas for SPB. The identification of high-use areas and high-value pine stands combined with hazard rating would allow concentrated efforts on these areas to minimize SPB losses. Continued cooperation between the Parkway and FPM to evaluate this system will help provide additional ways to integrate hazard rating and SPB management into the management policies of the Parkway.

PRECAUTIONARY PESTICIDE USE STATEMENT

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key--out of reach of children and animals--away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or in ways that may contaminate water or leave illegal residues.

Avoid inhalation of pesticide sprays or dusts, wear protective clothing.

If your hands become contaminated with a pesticide, wash them immediately with soap and water. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing,

remove clothing immediately and wash skin thoroughly. After handling or spraying pesticides, do not eat or drink until you have washed with soap and water.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicide from equipment, do not use the same equipment for insecticides or fungicides that you used for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary landfill dump, or crush and bury them in a level, isolated place.

NOTE: Some states have restrictions on the use of certain pesticides. Check your state and local regulations. Also, because registrations of pesticides are under constant review by the U.S. Department of Agriculture, consult your county agricultural agent or state extension specialist or FPM to be sure the intended use is still registered. For further information or assistance, contact Forest Pest Management, Alexandria Field Office, Pineville, La. 71360, (phone FTS 497-7280, or commercial 318/473-7280).

REFERENCES

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1980. Evaluation of southern pine beetle infestations on Natchez Trace Parkway in Mississippi. Report 80-2-7. 7 pp.

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